PROGRAMMABLE READ ONLY MEMORY (PROM)
PROGRAMMING PROCEDURE GUIDELINE

Introduction/Background

The Programmable Read-only memory (PROM) differs from the more conventional mask PROM mainly in that the devices are user programmable.

Programmable "fusible links" such as nichrome, polysilicon fuses can be blown (or fused) during the programming process. These fusible link based CMOS PROMs (e.g. Harris HS 6617, HS6664) are being used in applications such as program and data control storage, character/code generation and conversion, and look-up table on various NASA programs.

Several reliability concerns related to "fusible links" have been reported over the years such as improperly blown fuses, fuses "grow-back phenomenon, etc.

In general, some of the potential reliability issues and failure modes associated with PROMs can be attributed to:

- Improperly blown fuses that can regrow

- Inadequate/Improperly calibrated equipment used for programming

- Lack of proper handing procedures and ESD precautions

- Inadequate Software Interface Module (SIM) verification

- Failure to investigate low programming yield that may be associated with a questionable lot or electrical overstress

- Lack of proper training and/or certification of device programmer

Objective

The objective of providing this document is to develop standard PROM guidelines for programming procedures, electrical verification testing, and screening flow. The matrix developed can be used as guidelines and checklist during various phase of device handling and programming.

PROM Programming Procedure, Post-Electrical Verification and Screening Flow Checklist/Matrix.

The Table 1 lists PROM inspection and programming steps post-electrical verification and screening flow operations performed on PROMs during the test.

TABLE 1
PROM PROGRAMMING PROCEDURES CHECKLIST/MATRIX

Operations	Hardware	Software	Device
General Inspection and Device Programming			
ESD (1)	X (2)		X
Initial Visual Exam			X
Part Count			X
Workmanship			X
PROM Equipment Calibration (3)	X		
PROM Interface Board Verification	X		
Load Master Containing Pattern		X	
Verify Correct Pattern Format		X	
Software Interface Module Verification (SIM), (verifies software, manufacturer, P/N) (4)		X	
Load Software		X	
Program blank PROM (Pilot device)		X	X
Verify Device (Check Sum)		X	X
Program Blank PROM (Pilot device)		X	X
Verify Device (Check Sum)		X	X
Proceed with Programming of Flight Lot		X	X
Electrical Measurements			
Develop ATE Program			X
Functional Test			X
DC Parameters			X
AC Parameters			X
Screening Flow			
Pre Burn-in electrical measurements @ +25, -55 and +125°C			X
Dynamic Burn-in @+125°C (168 hours)			X
Post Burn-in Electrical @+25, -55, +125°C (5)			X
Final Electrical Measurement, Delta @+25 °C			X
Final Visual Examination			X

NOTES:

(1) Observe proper ESD precautions during all phases of handling and testing for example, if device programming pin needs to be tied to Vcc, it must be hardwired to Vcc
(2) An "X" indicate that an operation is required
(3) PROM programming should only be performed on calibrated equipment
(4) If SIM verification fail, contact Data I/O for proper device information
(5) Post programming burn-in required only if devices are procured as non-QML. Commercial devices